Project Details:
Team Energy L.L.C. - "Reducing Produced Water Through the Use of Density and Conductivity Meters"

Most oil bearing underground rock formations contain both oil and salt water. Oil and salt water are pumped to the surface using above ground pumping equipment connected to downhole pumps which are located deep in the well near the oil bearing formation. As oil and water are pumped from the well, additional oil and water from the formation flows into the well. In many older oil fields, low volume wells (or stripper wells as they are often referred to) produce a significant amount of salt water along with the oil. The relative amount of salt water usually increases over time as the well is produced and the oil is depleted, sometimes producing as much as 100 barrels of salt water or more for every one barrel of oil recovered. The costs of handling and disposing of salt water at the surface can become significant, often rendering the well unprofitable to operate. Once a well becomes unprofitable to operate it is shut down and eventually plugged and abandoned, usually leaving as much or more oil in the formation than has been produced.

In order to reduce the volume of salt water produced, thus reducing the operating costs associated with salt water handling and disposal, Team Energy L.L.C. in Bridgeport, Illinois, will test the feasibility of using specially designed instrumentation to determine the type of fluid (oil or water) being produced, pumping off only the oil and using the instrumentation to stop the pump when water is detected in the produced stream. The reasoning behind their effort is based on the principal that once a well is shut down and production stops, oil and water will continue to flow into the well until the pressure exerted by the column of fluid building up in the well equalizes with the pressure in the formation. Once the pressures equalize, the flow of oil and water from the formation ceases and the well then acts as a fluid separator with a column of oil separating out on top of a column of water. By placing the downhole pump suction just above the separated oil-water interface and restarting the pump, the oil can be withdrawn from the top of the column first, then the pump can be stopped leaving the salt water in the well. This cyclic pumping procedure is usually determined by trial and error, using a time clock to turn the pumping equipment on and off. Two types of instrumentation, a density meter (which measures the fluid's density) and an inductive conductivity meter (which measures the fluid's electrical conductivity), will be designed and tested simultaneously for comparison to determine which instrument performs best to identify whether oil or water is being produced. Since the density and electrical conductivity properties differ between oil and water, the instrumentation should be able to detect which fluid is in the produced stream.

This improved technique can be used to rigorously determine optimal pumping times, allowing low volume wells operating on time clocks to be set more precisely and quickly than the trial and error methods currently being used, resulting in a greater pumping efficiency. Operating the well more efficiently will reduce the pumping equipment's energy consumption costs and reduce the wear on both the surface and the downhole pumping equipment, saving on maintenance and overhaul costs as well as the well workover costs associated with removing and replacing the downhole pump. In addition to the reduced operating cost-savings benefits, reducing the volumes of produced salt water will reduce the environmental risks associate with producing, handling, and disposing of salt water on the surface. There are an estimated 400,000 stripper oil wells in the lower 48 states. Successful development of the proposed technology can extend the economic producing life of many of these low volume wells, preventing their premature

abandonment and allowing them to operate longer, increasing the amount of oil which can ultimately be recovered. Maintaining continuous production operations, infrastructure, and lease holdings is essential to maximizing the ultimate recovery of the nation's known domestic oil resources.

Total Project Cost: $ 147,662
DOE Share: $ 73,831
Team Energy L.L.C.: $ 73831 (Cost share 50 %)
Length of Project: 12 months.
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